

THE STATUS AND ECOLOGY OF THE HORNET MOTH, *SESIA APIFORMIS* (CLERCK) (LEPIDOPTERA: SESIIDAE), IN SUBURBAN SOUTH LONDON

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Abstract. The hornet moth (*Sesia apiformis* Clerck) is considered scarce in England but is probably under-recorded. The aim of this study was to establish its status in the south London Boroughs of Sutton and Merton. Results indicated that the moth was much more common in Sutton than Merton but may be declining. Contrary to previous thinking, trees surrounded by vegetation were more heavily infested than those devoid of basal vegetation. This may be explained by heavy predation pressure or selection of sub-optimal trees. Management implications are also discussed.

INTRODUCTION

The hornet moth (*Sesia apiformis* Clerck) is probably under-recorded but is still afforded nationally scarce status notable B (recorded from fewer than 100 10 km squares). It is locally widespread in central, southern and south-eastern parts of England. In London, Plant (1993) could only list six records since 1980 and so considered it an 'extremely local resident' (category 4). In Surrey, Collins (1997) found the moth only in the north-east of the county commenting 'recent systematic fieldwork in the streets of south London has revealed it to be locally common'. This paper gives more details of that fieldwork.

METHODS

Trees were thoroughly searched each year for the characteristic exit holes and protruding exuviae in the London boroughs of Sutton (since 1994) and Merton (since 1995). A site location list of all black poplar trees known to the local authorities was obtained from their Streets and Amenity Tree Management System (STEMS) database. For Sutton, this was obtained in 1996, so not all the trees were checked in earlier years. Sites with many trees were checked when most of the moths would have emerged (late July onwards); other sites were checked more than once, in which case, exuviae were removed to avoid double counting.

The hybrid *serotina* has been widely planted in both boroughs and accounts for most of the black poplar trees. The hybrid *italica* (Lombardy poplar) is the next most frequently planted and was never seen to contain exit holes; it was only checked on an *ad hoc* basis. Recently planted (< 10 years old) black poplars and white poplars were only checked when they occurred with mature black poplars.

RESULTS

The first exuviae found on Sutton trees were on 14.vi.1994, 13.vi.1995, 19.vi.1996, 14.vi.1997 and 10.vi.1998. The dates for Merton broadly concur with the exception

of 14.v in 1997. These data suggest that in most years emergence began in the second week of June but can occur in May. The date of the last exuviae was difficult to determine since exuviae were being found into August, from moths which may have emerged much earlier. However, at some of the more regularly checked sites, emergence was recorded after 19.vii in 1996 and 1998.

Tables 1 and 2 list for Sutton and Merton the location of poplar trees, excluding Lombardy poplar, and the number of exuviae found each year. Fig. 1 maps the distribution. Over the study period, evidence of current but not necessarily continuous infestation was found at 22 of 28 sites (79%) in Sutton and 7 of 16 sites (44%) in Merton, although for some sites, exuviae were not found every year. It was not possible to determine the precise number of trees infested but by taking the year with the most trees infested for each site, then 104 (27%) and 16 (6%) were infested in Sutton and Merton respectively. Both of these figures are underestimates, particularly Sutton, since other trees will have been infested in other years. In Sutton four sites had more than ten infested trees while in Merton, only Morden Hall Park, with seven infested trees, had more than two infested trees. In Merton, with the exception of the aforementioned site and Wandle Road, infested trees were only found in the Mitcham area. It should be noted, however, that Mitcham was the most intensively searched region of the borough. There were five sites which showed no evidence of either current or past infestation: Sutton Cemetery and St Dunstan's Hill in Sutton; Mitcham Common, Morden Park and Wimbledon Park in Merton. Although Mitcham Common showed no evidence of past infestation, it is close to some infested roadside sites including Commonsides East, Aspen Gardens and Windmill/Croydon Road, which are effectively sub-sites of the Common.

Table 3 shows the distribution of the number of exuviae found per tree in Sutton. Most trees had fewer than four exuviae in a year but 'good' trees could have up to ten. One exceptional tree, which was riddled with holes, had the following counts of exuviae: 10 (1994), 26 (1995), 7 (1996), 9 (1997) and 29 (1998). Furthermore, access to this tree was difficult preventing a thorough search and removal of exuviae, so these numbers are undoubtedly minima. This tree, although badly in need of pollarding, was still healthy. The next most prolific tree had the following counts: 10 (1995), 17 (1996), 1 (1997) and 3 (1998).

Although no attempt was made to record the direction faced by protruding exuviae, it was clear that there was no preference with many exuviae facing to the north and others to the south. Also, exuviae were often found in trees surrounded by dense vegetation around the base of the tree and even in one tree whose base was covered on all sides by ivy. Table 4 shows trees classified according to their habitat. 'Open' indicates trees surrounded by gang-mown grassland and 'closed' surrounded with vegetation, with 'intermediate' having some vegetation. The table shows that there is a preference against open habitats, with the highest level of infestation occurring in the closed category. Many of the trees in open sites had old exit holes (holes that did not have exuviae and looked weathered).

In both Merton and Sutton, most exuviae were found close to the base of the tree and with two exceptions were within 60cm of the ground. The first was the Sutton tree riddled with holes already referred to, where holes and exuviae reached up to 2m. The other was the tree covered in dense ivy where the only two exuviae found were about 1m from the ground. Others may easily have been missed amongst the ivy.

Exuviae were usually found in trees with a diameter greater than 1m; however, they were occasionally seen in trees with a diameter of 15cm when close to larger trees. Exuviae were also found in stumps which had been cut down more than five

Table 1. Sutton sites searched for the presence of hornet moth

Site and grid reference	No. of trees	No. of infested trees (No. of exuviae)				
		1994	1995	1996	1997	1998
Parks Open spaces:						
Beddington Park TQ294655	16	1/6	2/4	0	0	0
Beddington Farmlands TQ290665	6	—	1/2	0	2/2	0
Belmont Park TQ256622	1	—	—	0	1/1	1/2
Culvers Island TQ279661	15	—	7/18	6/19	11/25	9/17
Dale Park TQ279659	15	(1/2)	8/21	6/32	1/1	8/15
Ecology Centre TQ278647	1	0	1/1	0	1/1	0
Grove Park TQ282648	8	—	—	1/1	0	1/1
Manor Gardens TQ287651	5	—	—	2/2	2/4	0
Mellows Park TQ299641	1	—	—	1/1	0	0
Mill Green TQ282670	3	3/6	3/5	1/1	0	1/1
Pyl Brook, Stonecot TQ244658	78	—	17/34	25/47	19/29	11/15
Rosehill Park TQ259662	83	(4/6)	12/18	9/15	14/37	8/11
Roundshaw Park TQ299631	14	1/1	0	0	0	1/2
Roundshaw Playing Fields TQ307635	13	—	—	1/1	2/2	6/8
Royston Park TQ268654	5	—	—	0	1/2	0
Sears Park TQ246642	4	—	0	0	0	0
Sutton Cemetery TQ249650	6	—	—	—	0	0
Stanley Park TQ279630	14	0	0	0	0	4/9
Wilderness Island TQ283656	1	1/6	1/5	1/2	0	1/1
Wrythe Recreation Ground TQ275651	1	—	—	0	0	0
Streets:						
Beddington Lane TQ293669	4	—	—	—	4/10	—
Belmont Rise TQ251623	2	—	0	0	0	0
London Road TQ283666	31	(3/12)	8/62	10/37	10/40	10/60
Pine Walk TQ266620	5	1/1	0	1/1	0	0
Richmond Road TQ305653	46	—	—	—	—	4/4
St Dunstan's Hill TQ245645	1	—	0	0	0	0
Schools:						
Barrow Hedges TQ273631	1	—	—	1/2	0	—
Victor Seymour TQ278650	3	—	0	—	—	—
Total number of trees	383	54	292	324	334	375
Total number of infested trees		7	61	65	68	65
% of trees infested		13	21	20	20	17
Total number of exuviae		20	170	161	154	146
Mean no. of exuviae per infested tree		2.86	2.62	2.48	2.26	2.28
Yearly comparisons of exuviae						
	1994-95	20	15			
	1995-96		170	154		
	1996-97			161	144	
	1997-98				144	142
	1995-98		170			131

For counts in parentheses, not every tree was checked and these sites have been excluded from the totals.

Table 2. Merton sites searched for the presence of hornet moth

Site and grid reference	No. of trees	No. of infested trees\			
		No. of exuviae			
		1995	1996	1997	1998
Parks/Open Spaces:					
Sir Joseph Hood Rec. TQ226671	12	2,2	0	0	0
Mitcham Common* TQ286681	64	0	0	0	0
Morden Cemetery TQ231672	50	0	0	0	0
Morden Hall Park TQ262686	34	7,10	0	0	0
Morden Park TQ246673	13	0	0	0	0
Wimbledon Park TQ245725	65	0	-	0	0
Streets:					
Aspen Garden* TQ281675	7	—	0	2,11	1,5
Beddington Lane* TQ293672	11	0	0	0	0
Commonside East* TQ292681	1	1,4	1,8	1,3	1,2
Eastfield Estate* TQ288691	7	0	0	0	0
Wandle Road TQ269679	2	1,1	2,2	1,1	0
Windmill Croydon Road* TQ291676	24	—	-	1,1	1,4
Schools:					
Hatfield TQ240672	2	0	0	0	0
Lonesome* TQ285694	2	0	0	0	0
Rowan* TQ293691	2 (1 1997)	0	0	0	0
Sherwood* TQ294681	1	1,3	0	0	0
Total number of trees	297	266	208	296	296
Total number of infested trees		12	3	5	3
% of trees infested		4.5	1.4	1.7	1.0

*Mitcham site.

years ago but were still alive with plenty of suckers. They were also recorded in white poplars on two sites but never Lombardy poplars.

DISCUSSION

There is the assumption that clearwings are under-recorded due to their diurnal habits. However, it is relatively easy to find evidence of many species of clearwing. There were old records of hornet moth in both boroughs but the existence of an arboricultural database (STEMS maintained by the local authority) greatly increased the comprehensiveness of this study. This study found at least 27% of poplar trees to be infested in Sutton and 6% in Merton with hornet moth. Plant (1997) reviewing this fieldwork considered 'this is surely the most clear evidence that this moth is grossly under-recorded in the London area'. We consider that this could be the case but perhaps equally likely is that Sutton is a hotspot. Without prejudging the issue, we tend towards the latter. Sutton is much more heavily infested than Merton and casual inspection of suitable trees in neighbouring boroughs did not reveal any exuviae. Nevertheless we accept that this issue will only be resolved with further fieldwork and we hope that this article may prove the impetus for more people to search their local poplar trees. The need for such work is reinforced by a recent note

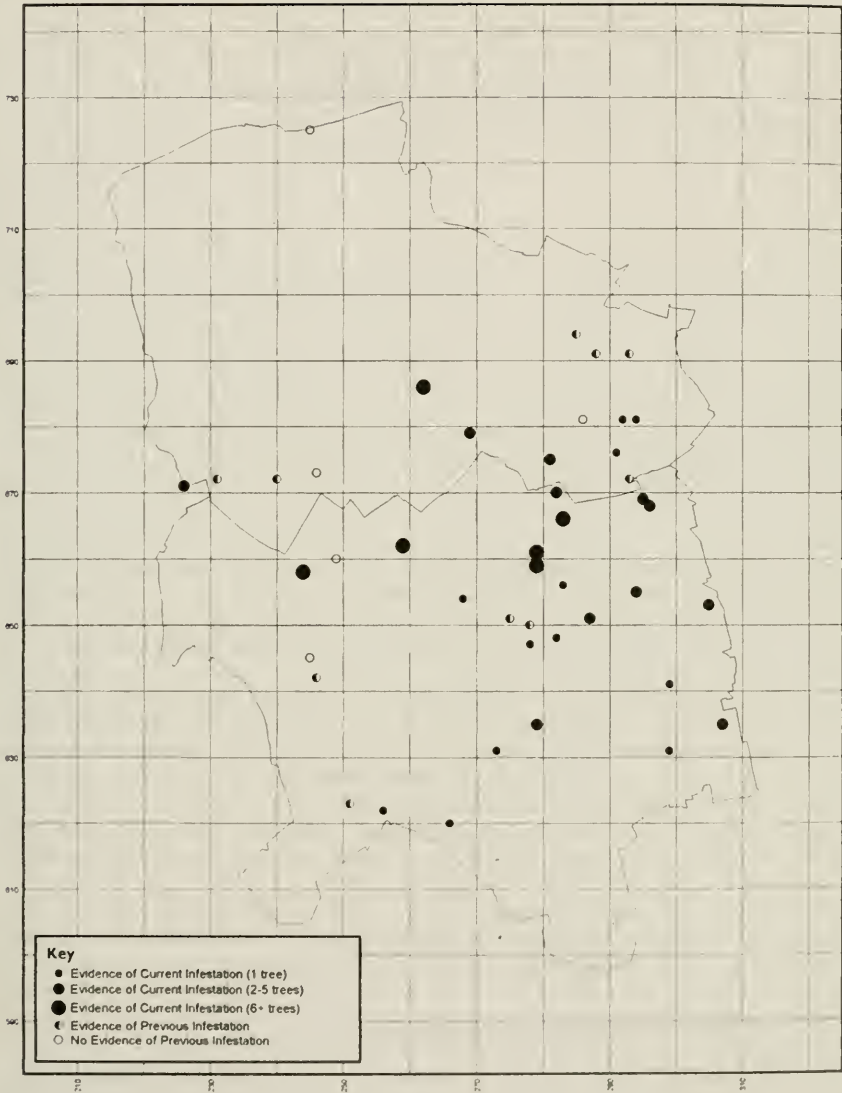


Fig. 1. Hornet moth: distribution and current status in LB Merton and Sutton.

in the arboricultural literature (Gibbs *et al.*, 1998) which suggested that this species of moth is causing 'extensive bark damage' to poplars in eastern England and may be responsible for crown dieback. We found neither evidence of bark damage nor crown dieback.

In our study area, despite the high prevalence, there is circumstantial evidence to indicate that the population is declining. Many moth populations fluctuate widely in

Table 3. Distribution of exuviae from Sutton sites between 1994 and 1998

No. of exuviae tree year	No. of trees
1	117
2	59
3	31
4	9
5	5
6	6
7	4
8	6
9	1
10	2
17	1
26	1
29	1

Excludes a few sites where the information was not recorded.

numbers from year to year making the detection of trends difficult. Hornet moth is no exception, the counts from Dale Park being particularly erratic. However, this moth very probably occurs at low density, so a decline would be of concern. We believe the following evidence points towards the population being in decline.

- Most sites have old exit holes indicating former infestation. In Sutton only two sites did not have old exit holes. At Richmond Road, where there are 46 trees, every tree had old holes but only four were infested in 1998. In Merton six of the nine non-infested sites had old exit holes. Morden Cemetery has numerous apparently suitable poplar trees, many with old holes; however no exuviae were seen, suggesting site extinction. Furthermore exuviae have not been found since 1995 at Sir Joseph Hood Recreation Ground, which is contiguous with the Cemetery.
- For several sites in both boroughs, exuviae occur in small numbers and have not been seen every year, although most of the trees had exit holes. Morden Hall Park shows a particularly worrying decline. Occasional inspection of the trees before

Table 4. Infestation of trees in Sutton according to habitat

	Open	Intermediate	Closed
No. of tree-years	453	217	384
No. of infested tree-years	29	41	114
% infested	6	19	30
No. of exuviae	49	70	303
Mean per infested tree	1.69	1.71	2.66

All fully checked sites from 1994 to 1998 have been included, except Pyl Brook and the two school sites. In addition, the two most heavily infested trees (one would have been classified as intermediate and the other closed) have been excluded to avoid them distorting the figures.

1995 always revealed exuviae and in the first year of this study a relatively high count was recorded, but none since.

- The yearly counts of exuviae show some evidence for a decline. It is considered that our searching efficiency has remained relatively constant over the study period and so totals from sites counted in consecutive years do provide a measure of how the population is faring. Between 1995 and 1998 in Sutton, there were declines of 13% for the mean number of exuviae per infested tree and 24% for the total number of exuviae.

Prior to this study it was considered that the moth preferred trees devoid of surrounding basal vegetation (Waring, in press); our data suggests otherwise. We consider that there are two possible explanations for this.

Adult females can lay up to 1400 eggs (Heath & Emmet, 1985). The number of exuviae found is undoubtedly lower than the number of moths emerging; many exuviae are likely to be missed when searching amongst dense vegetation or may be blown away by strong winds. Nevertheless, even allowing for this it would appear that there is heavy mortality between egg and adult. Whilst it is impossible to determine the key mortality factor from our study, we consider that predation of both the pupa and emerging moth may be significant. Exuviae were sometimes found at a short distance from the tree, which could indicate predation by, for example, great spotted woodpecker, although none were seen during early morning searching. Accordingly egg-laying females may select trees surrounded by vegetation to reduce this threat.

Alternatively, it may simply be determined by tree suitability. It is possible that there is a limit to the number of larvae a tree can provide food for, after which it is no longer chosen by females. If this is the case, then it would be expected to find a large number of trees with old exit holes and young trees would be infested as soon as they became suitable. At Stanley Park, which has three large trees with old exit holes and several young trees, no exuviae were found until 1998 when nine were found in four of the young trees. It is feasible that trees surrounded with vegetation are only selected after 'open' trees are no longer suitable. The other interesting aspect is why larvae do not seem to feed higher up in the tree. In only two trees were exuviae found above 60 cm.

Thus the observation that trees surrounded by vegetation are preferred can be explained by either heavy predation pressure or selection of sub-optimal trees. Nevertheless, both of the explanations suggest that the population may be unsustainable either as a result of heavy predation or through the lack of suitable trees. With this in mind, management to arrest decline should be implemented. We consider that there is an urgent need for more black poplars to be planted, especially in Sutton. Furthermore, the current stock of trees in both boroughs should be maintained by pollarding on a regular cycle and felling should only take place where public safety is an issue, and in such circumstances a 'stump' of 1–2 metres left *in situ*. The recent changes in the maintenance of municipal parks and the trend towards leaving vegetation around the base of trees uncut clearly has management implications for the moth; however, advice on the most appropriate management of basal vegetation requires further work.

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SHORT COMMUNICATION

Peritrechus gracilicornis Puton (Heteroptera: Lygaeidae) in West Cornwall—In September 1993 I took *P. gracilicornis* at two localities in West Cornwall. At Glendurgan Gardens, West Cornwall (SW772277), on 16 September, the combination of a shower of rain and a sleeping child brought about a brief postponement of a planned tour of the gardens, and I whiled away the time by investigating a large compost heap in partial tree shade beside the car park. Ten minutes of tapping the overhanging thatch of the heap over a tray was rewarded by a large number of *Peritrechus*, some of which had markedly pale hind tibiae. A sample of twenty pale-legged individuals removed for closer examination proved to consist of five *P. gracilicornis* and fifteen *P. geniculatus* (Hahn). This collecting method also produced additional species of Heteroptera: *Anaptus major* (A. Costa), *Anthocoris nemorum* (L.), *Aptus mirmicoïdes* (O. Costa), *Dryinus ryei* Douglas & Scott, *Dryinus sylvaticus* (Fab.), *Plinthisus brevipennis* (Latreille), *Scolopostethus affinis* (Schilling), *Scolopostethus thomsoni* Reuter, *Stygnocoris fuliginus* (Geoffroy), *Stygnocoris sabulosus* (Schilling) and *Xylocoris galactinus* (Fieber), as well as the weevils *Orthochaetes insignis* (Aubé) and *O. setiger* (Beck). A considerably longer list could no doubt have been obtained by more prolonged investigation.

It is not clear whether the *P. gracilicornis* were in the compost heap voluntarily. A considerable amount of material had been recently added to the pile and many insects may have been incorporated with it. Certainly some of the other species recorded would not usually be expected from a compost heap. On the other hand, *Peritrechus* seem attracted to heaps of cut vegetation, at least for overwintering purposes. I have, for example, beaten very large numbers of *P. geniculatus* and *P. nubilus* (Fallén) from piles of cut sedge at Chippenham Fen NNR, Cambridgeshire (TL646694) on 5.x.1992, and *P. geniculatus* from stacked straw at the margin of an arable field near Oldfield Pond, Northamptonshire (TF132002) on 19.iv.1993. Whether their presence in the compost heap was voluntary or not, the *P. gracilicornis* of Glendurgan Gardens must have a more natural habitat for at least part of the year, but where this might be, in or near the extensive and varied gardens, must remain uncertain.